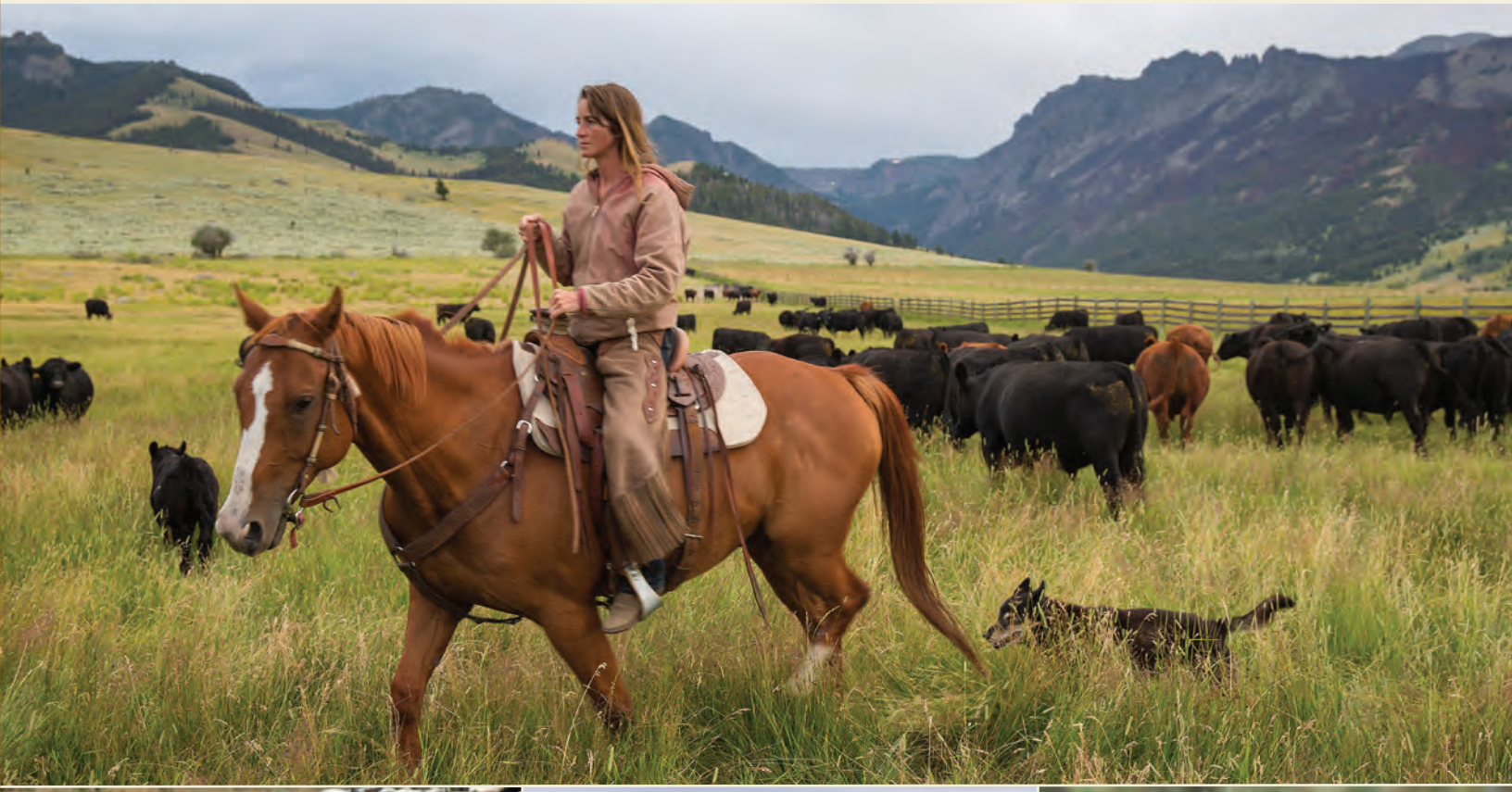
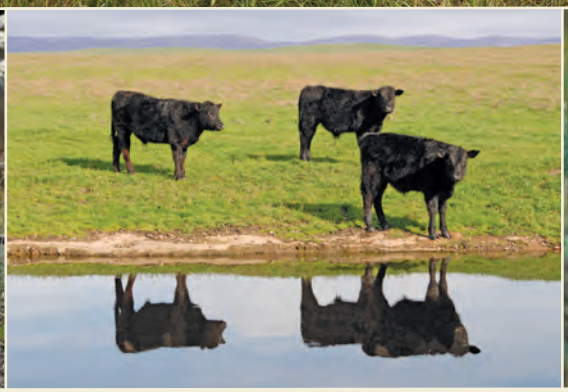
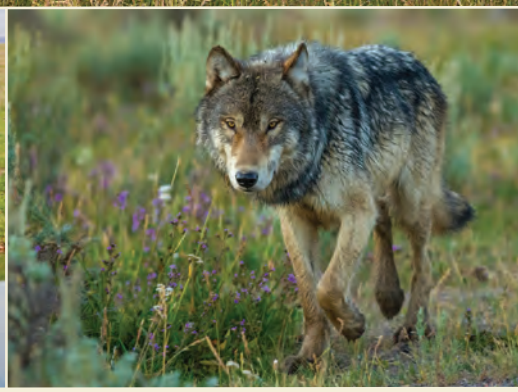
Livestock and Wolves

A Guide to Nonlethal Tools and Methods to Reduce Conflicts







SECOND EDITION

DEFENDERS OF WILDLIFE

Defenders of Wildlife is a national, nonprofit membership organization dedicated to the protection of all native wild animals and plants in their natural communities.

Acknowledgements

Principal Author

Suzanne Asha Stone

Contributing Authors

Erin Edge, Nina Fascione, Craig Miller, Charlotte Weaver

Other Contributors

Brian and Kathleen Bean, Stewart Breck, Ray Coppinger, Tom Gehring, Pete Haswell, Marco Musiani, Fernando Najera, Carter Niemeyer, Brad Purcell, Linda Thurston, Jesse Timberlake, Rick and Carol Williamson, Ian Whalan

Editorial Team

Kate Davies, Charlotte Weaver

Designer

Maureen Gregory

Special thanks to the Park Foundation, Lava Lake Institute and Lava Lake Lamb; Blaine County Commission; Montana Department of Fish, Wildlife and Parks; Oregon Department of Fish and Wildlife; Washington Department of Fish and Wildlife; U.S.D.A. National Wildlife Research Center; Natural Resources Conservation Service; Nez Perce Tribe; Confederated Tribes of the Umatilla; University of Calgary; Oregon State University; Washington State University; University of Washington; University of Montana; Central Michigan University; Animal Welfare Institute; Wolf Recovery Foundation; United Kingdom Wolf Conservation Trust; National Wolfwatchers Coalition; Toyota TogetherGreen; Idaho Golden Eagle Audubon; U.S.D.A. Wildlife Services; U.S. Fish and Wildlife Service; and Yellowstone National Park.

Defenders of Wildlife
1130 17th Street, NW
Washington, D.C. 20036-4604
202.682.9400
www.defenders.org

Cover photos: range rider © Louise Johns; sheep and fladry © Brad DeVries/Defenders of Wildlife; black angus cattle © Terrance Emerson/Adobe; wolf © Sandy Sisti

Printed on 100% recycled paper, 60% post-consumer waste, processed chlorine-free.

Table of Contents

Payette National Forest, Idaho

Introduction

As a livestock producer operating in areas where wolves live, you have likely wondered how you can keep your animals safe in an economically viable way. You may have raised livestock for decades before wolves returned to your region and may be unsure of what to do to prevent livestock losses should wolves show up near your operations. In some areas, wolves are protected under federal, state or provincial law, so you need to know what conflict-prevention strategies you can legally use. Most important, you need to know what will work best in your particular situation.

Sometimes wolves are killed to prevent additional livestock losses. Lethal control may relieve conflicts temporarily, but new wolves usually move into the vacated territory, and, unless the root cause is addressed, the cycle of loss may continue. The purpose of this guide is to help you consider how to best address the root cause of wolf depredation in economical ways that protect both livestock and wildlife. It covers nonlethal tools, methods and strategies that work and offers real-life examples of successful solutions devised by livestock producers, agency managers and researchers working together.

Chapter 1 describes key factors to consider when evaluating your own livestock operation. Chapters 2 through 8 provide examples of the different approaches and their benefits and limitations. Please note that this guide provides a basic overview, but it is not intended as a substitute for personal expert advice. You may still need the help of wolf-management professionals to evaluate and tailor nonlethal control measures to your situation. You can find these experts in the state-by-state Resource Directory at the end of the guide. For even more information, check the references and additional readings in the bibliography.

We hope you find this guide helpful and welcome your feedback on it. Please contact any of the Defenders field offices (listed by state in the Resource Directory) to share your thoughts and experiences. Your feedback is valuable and may be helpful to other livestock producers or resource managers.

HOW THIS GUIDE EVOLVED

In 2006, Defenders brought together wildlife conservationists, biologists, academic researchers, agency specialists in wolf-livestock conflicts and livestock producers operating in wolf range for a workshop. Together we evaluated proactive livestock protection tools and nonlethal methods and strategies that help reduce livestock losses to wolves.

In 2008, Defenders published a manual incorporating the experiences, insights and recommendations of the workshop participants and information from ongoing discussions and interactions with livestock producers and wildlife and agricultural researchers.

This second edition of the manual includes updates that reflect the best protocols after a decade of testing and applying these methods and strategies in a wide range of situations.

1. Assessing Your Needs

Deciding which tools, methods and strategies are suitable for protecting your livestock depends on many different factors. Start by contacting local wildlife managers to help you evaluate your situation and identify what will work best for your operation.

What type of livestock you need to protect and what predators are present are important considerations. Research suggests that when wolves attack livestock, they focus on the animals that are easiest to kill. For instance, wolves rarely attack adult cattle and horses. They tend to prey more on sheep, calves, goats and yearling cattle.

Other key considerations are where, when and how your livestock are grazing. Livestock dispersed on large grazing allotments—publicly owned lands where grazing is allowed by permits issued by the federal government—can be one of the most difficult wolf-livestock conflict situations to resolve. Many of these allotments are in remote and rugged terrain with very dense trees and brush and are often scattered, making it harder for sheepherders, range riders or wranglers and livestock managers to spot a potential conflict.

Overall, the important factors to consider include:

- Number, age, health and type of livestock
- Whether livestock are scattered or grouped
- Season
- Location and accessibility of site
- Size of grazing area
- How often people directly supervise the livestock

Thinking like a wolf

When developing a strategy for reducing risk to your livestock, it helps to understand things from a wolf's perspective.

Wolves are natural hunters, but they are also opportunistic scavengers, and the scent of a rotting carcass will attract them. In northeastern Oregon, biologists discovered livestock carcass pits using only satellite data from radio-collared wolves that showed frequent visits to the sites of the pits. Once producers removed the pits, the wolves lost interest and eventually stopped visiting these sites.

Naturally adept at detecting injured or diseased animals, wolves often focus on the weakest animals in a herd or band. A wolf can usually tell if a healthy adult animal it normally would not attack has somehow become disadvantaged—hindered from escape by deep snow, for example.

In addition, wolves learn quickly and can overcome their fear of certain scare devices such as sounds or lights if repeatedly exposed to them. Depending on your situation, changing devices and methods frequently will help keep wolves from getting habituated to them and losing their natural wariness.

Increasing the wolf's perception of risk can help reduce the chances of livestock losses, but working proactively to prevent wolves and other predators from being attracted to your livestock operation in the first place (see Chapter 2) is often the best strategy.

A range rider surveys a livestock watering hole on a Wyoming grazing allotment.

Livestock stress and permit considerations

When practical, building small night corrals to protect livestock within a small pasture is often effective and economical, compared to installing predator-deterring fencing around large multi-acre pastures, which can be costly. Some livestock producers are successfully using electric night pens on private pastures where livestock can more easily adapt to these enclosures or to temporary, easily moveable pens like those constructed from fladry.

One band of sheep in Montana was so well-adapted to its night pen that, like chickens returning to their coop, the sheep entered the pen on their own at the end of the day. In New Mexico, a rancher using a two-strand electric fence system to create small, easy-to-monitor pastures reports that his cattle are so accustomed to their routine that he can move his entire herd in less than half an hour using only a whistle, two dogs and a load of fresh feed.

Penning livestock every night can present challenges, too. Penning can stress animals not accustomed to it, and increased stress may affect their condition. Moreover, grazing permits on national forest land may not allow it in areas where overgrazing or trampling of vegetation can harm native plants.

Chapter 4 provides more information on fencing.

Seasonal and location-based considerations

Some grazing sites require different strategies depending on the season or location. For example, if you decide to use livestock guardian dogs (LGD) to protect your animals, you should avoid using them near wolf den sites in spring when wolves will instinctively defend their young from other canines (dogs, coyotes or other wolves that are not members of their pack). Using LGDs in these areas during the springtime actually increases the likelihood of conflicts with wolves. However, using LGDs at other times of the year with sheepherders or range riders present to assist the dogs helps reduce livestock losses to wolves. Chapter 3 addresses these issues and more on LGDs.

The importance of record-keeping

Good record-keeping is a valuable tool in resolving wolf-livestock conflicts. Records of interactions and related observations are useful in identifying trends, problem areas and vulnerable times of year, which can help improve the effectiveness of targeted, preventative measures. Good records provide reliable information to inform decisions on the type of devices or activities most appropriate for a particular situation and guide their use. This can reduce the need for experimentation and improve the likelihood of success. For example, records can show where repeated predator problems occur and when. Based on that information, you can simply change grazing schedules to use problem pastures at other times or for less vulnerable livestock.

In addition to keeping good records of wolf-livestock interactions and other observations, it is important to count your livestock regularly when possible—especially in large pastures, allotments or areas with dense vegetation and/or rugged terrain where dead livestock can go undetected for weeks or months. Producers who do not regularly monitor their animals can suffer substantial losses before they even know their livestock are missing. This makes it more difficult to identify and implement timely and appropriate techniques that could reduce livestock casualties and the need for wolf control. It can also complicate the cause-of-death determinations typically required where compensation payments are available.

Communication, agreement and evaluation

Working with agency staff, other livestock producers and local conservationists consolidates resources, reduces costs and increases the chances for success. It can also help resolve conflicts between agricultural and environmental advocates. As one rancher puts it, coming together is "a great place to start," because "the collaborative process works and can help those with divergent opinions resolve misunderstandings without damaging the value of one another as human beings." A written agreement that clearly defines expected roles and responsibilities and fosters good communication is essential to setting the foundation for a productive collaborative process. A system for evaluating the project should also be included as each project, whether successful or not, provides valuable information about the effectiveness of methods in varying situations. ■

KEY POINTS: Assessing Your Needs

- Contact state and federal wildlife managers to help evaluate your situation and identify appropriate techniques for your operation.
- Consider the number, age and type of livestock; the season; the size of the grazing area and how often people check on the livestock.
- Be proactive by taking actions to reduce or eliminate predator attractants on your livestock operation.
- Evaluate your livestock protection strategies often to ensure that you are using different strategies and not habituating wolves to a deterrent with repeated use.
- When working with a team from different agencies or organizations, develop a written agreement describing duties and roles.
- Keep records of what you are doing so you can evaluate, compare and modify as needed.

2. Reducing Attractants

Like other canines, wolves have a very good sense of smell and can detect prey from miles away. The scent of a decomposing carcass or sick animal is enough to attract a hungry wolf. Any dead, diseased or dying animal left unguarded is an attractant for scavengers and easily identified as vulnerable prey by predators. Once animals that are both scavengers and hunters—such as wolves, bears and eagles—are drawn to an area, the likelihood increases that they will go from feeding on a carcass to hunting and killing live cattle or sheep nearby. The afterbirth from calving can also be a powerful attractant for wolves, a fact to consider when planning the timing and location of calving activities (see Chapter 8).

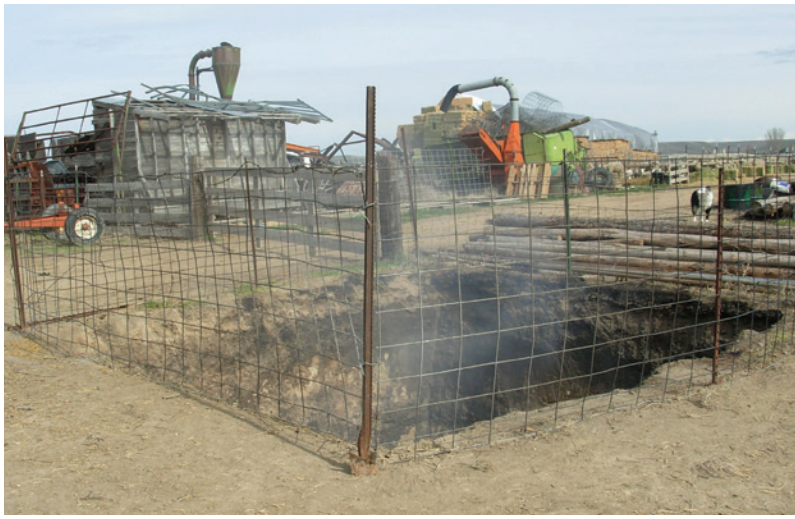
Hauling away, burying or burning livestock carcasses rather than leaving them in the field to decay reduces the chances of attracting scavengers. It also limits the food supply in the area, which can reduce the number of scavengers in general. Once a wolf becomes used to a food source, such as dead livestock, it is more difficult to stop it from returning to look for an easy meal. Other attractants include sick or dying livestock, birthing areas and, oddly enough, domestic adult ram sheep. Wolves often target domestic rams over ewes and lambs. Wolf managers don't know yet why this occurs, but it happens frequently enough to warrant consideration.

OREGON DEPARTMENT OF FISH AND WILDLIFE

A trail camera captured these wolves attracted by the carcass of a sheep. Scavengers as well as predators, wolves are drawn to dead animals.

Constructing a carcass pit

When carcass removal isn't possible, some livestock producers use pits to dispose of dead livestock. While carcass pits—especially poorly constructed or maintained ones—will still attract scavengers, reducing access to them helps discourage return visits. To limit access, a carcass pit should be located away from homes and areas used by healthy livestock—especially calving pastures and water sources—and should be properly constructed and maintained. Adding lime below and above the carcasses accelerates decomposition. When the pit is full, it should be buried under several feet of dirt to discourage scavengers. This will not deter bears however, so please consult bear experts if you are also protecting livestock from bear depredation.



© SUZANNE ASHA STONE/DEFENDERS OF WILDLIFE

Fencing around a deep carcass pit is an added barrier to wolves and other scavenging predators drawn to the area.

Regularly burning or burying carcasses in the pit helps keep wolves away from your area. Surrounding the pit with predator-resistant electric fencing provides an additional barrier, which is particularly important if bears are present. Using either a rendering facility, a managed carcass-composting site or a commercial landfill is the best way to dispose of carcasses, but if those alternatives are not available, constructing a carcass pit or burying carcasses may be the next best option. ■

KEY POINTS: Reducing Attractants

- Remove diseased or dying livestock from areas where they can attract wolves and other animals.
- Increase livestock protection efforts for rams when present in wolf range. Wolves have demonstrated an aggressive propensity to domestic rams and may target them over ewes and lambs.
- Haul away carcasses or dispose of them in properly constructed and maintained pits whenever possible.
- Make your carcass pit as deep as possible (6 to 8 feet) and cover it to discourage most scavengers from digging it up.
- Routinely burn carcasses in the pit or bury a full pit under several feet of dirt.
- Install electric fencing around your carcass pit to further reduce the chances of wildlife using it to feed on carcasses.

3. Working with Livestock Guardian Dogs

Livestock producers around the globe have long relied on dogs to protect livestock from predators such as wolves, bears and lions. In some instances, the mere presence of dogs helps keep wolves away from livestock. In other cases, dogs play a more active role by alerting herders to wolves and other predators in the area.

The ability of a livestock guardian dog (LGD) to protect livestock is partly a result of genetics and careful breeding and partly a result of socialization and proper training. Over the centuries, people have selected the best working dogs for breeding purposes to pass along valuable traits to future generations. Dogs that harassed or harmed livestock were typically relieved of duty and not permitted to breed, thereby removing undesirable traits from the gene pool. Socializing and bonding pups with livestock is a crucial part of their training (see page 7). The climate and landscape in which the dogs live, the distances they travel, the diseases they are exposed to and their food supply also influence their behavior.

In North America, the use of LGDs, mainly to protect sheep and goats from coyotes and domestic dogs, has been growing since the mid-1970s. Great Pyrenees, Anatolian shepherds, Akbash and other breeds that have been used for centuries in Europe, Asia and Africa are now used to protect livestock throughout the United States and Canada.

Breeds that make good LGDs are not the same breeds that make good livestock herders. The two functions, guarding and herding, are quite different, and the dogs that do best at each task have been bred for their specific tasks. In other words, border collies are bred to herd; Great Pyrenees are bred to guard.

How effective are LGDs? Researchers at Hampshire College in Amherst, Massachusetts, the U.S. Fish and Wildlife Service's National Wildlife Research Center in Colorado and the U.S. Sheep Experiment Station in Idaho addressed this question by placing LGDs on farms and ranches throughout the United States. Almost immediately, they received reports of fewer livestock losses from predators. Most of the cases studied focused on coyote attacks on sheep and goats, although other predators such as domestic dogs, mountain lions and wolves were included.

Tests of the ability of LGDs to protect cows from wolves in northern Minnesota and Michigan demonstrated that with proper management dogs can be effective. Interviews with cattle ranchers in Kenya, Turkey and Italy also suggest that properly managed LGDs can play a valuable role in protecting against a wide variety of predators. The U.S. Department of Agriculture (USDA) National Wildlife Research Center is currently conducting field studies of LGDs and results from this study should be available in 2016.

The Anatolian shepherd is one of several breeds developed to guard livestock.

Choosing and using livestock guardian dogs

To determine if LGDs are suitable for your operation, consider your primary needs and how such a dog could fit into your current management program. Professionals at the USDA, local agriculture extension agents, other livestock producers experienced with LGDs, breeders and breed clubs can help you evaluate your situation and provide advice on dog selection and use.

Regardless of breed, selecting your pups from good working stock and similar livestock operations is important. Pups learn from their mothers, so make sure she has the characteristics of a good LGD. Base your selection on a dog's working potential, rather than breed registration and physical standards. Pups can learn behavior, but not all registered LGD breeds are born with the instincts necessary to do well. The right LGD is the one that demonstrates the traits necessary for your particular situation. Desirable LGDs reliably stay with their livestock and successfully defend them by alerting people to the presence of threatening predators.

Open-range operations with large flocks or herds of livestock usually require more dogs than a small operation. LGDs should stay with livestock rather than chase or fight with wolves (or other

predators). An LGD permitted to give chase will end up far away from the herder and in an unnecessarily risky position that can result in the injury or death of the dog.

When wolf packs have new pups, generally from April through June, keep LGDs and other dogs away from known wolf den sites and use other means (such as fladry, grazing location alternatives or devices that scare wolves away) to avoid conflicts with wolves. While denning, wolves appear to perceive dogs as a threat to their pups, much as they would perceive unfamiliar wolves, and may defend their young by seeking out and killing the dogs.

During other parts of the year, livestock owners who are working three or more LGDs together to defend large sheep bands regularly report a decrease in predator attacks. Wolves, particularly lone wolves, tend to avoid encounters with other packs of wolves and appear to perceive multiple dogs as another pack.

Although the use of multiple dogs is recommended for large operations, there is also a limit to the number of LGDs that can be adequately cared for and managed effectively. Some producers report that when five or more LGDs are used per flock of sheep, the dogs become more interested in socializing with each other rather than in guarding livestock. As a rule, more dogs are more effective in larger livestock operations, but the characteristics of the individual dogs play a critical role in their ability to work together as a team.

© BRAD DEVRIES/DEFENDERS OF WILDLIFE

A Great Pyrenees stands guard on an Idaho sheep ranch.

RAISING AND TRAINING LIVESTOCK GUARDIAN DOGS

If you decide to raise your own LGDs from pups, it is crucial that they are well socialized with the type of livestock they will protect. It is especially helpful if they can learn from an experienced LGD.

Experts recommend raising guardian pups in the corrals with livestock, starting when they are four to five weeks old. Discourage pups from straying from the corrals and return them to the livestock if they stray.

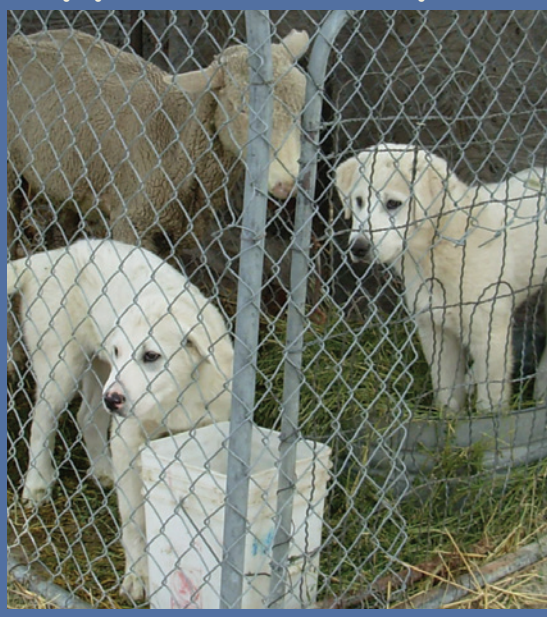
Minimize the handling and stroking of pups. Do not treat them like pets. A good LGD will come when it is called and allow the owner to handle it (for vaccinations and other health-related needs), but should not seek attention from people.

Provide the pups with nutritious dog food, and do not keep them in dugouts or doghouses except in extreme and threatening weather conditions. Instead, encourage pups to dig their own dirt beds and sleep among the livestock. This will help bond the pups and livestock.

When the pups are old enough, have them accompany livestock to the rangeland. Discourage unacceptable behavior such as biting or chasing livestock and pulling wool. Immediately remove any dogs that persist in chasing, biting, injuring or killing livestock.

Follow these training guidelines and your dogs will learn important lessons during the development period when they are most responsive to people and to livestock.

Guarding dogs raised with livestock bond with their charges.



© BRAD DEVRIES/DEFENDERS OF WILDLIFE

Great Pyrenees pups are ready for transport to farms in the Great Lakes region where researchers will monitor their effectiveness at protecting livestock from predators.

Some LGD breeds are more aggressive than others toward people. This may be an important consideration if you ranch in a populated area versus an isolated one. For example, if you intend to use LGDs in or adjacent to federal lands, such as a national forest or recreation area, there may be safety issues to consider concerning hikers, cyclists, horseback riders and their pets. LGDs that are too aggressive may pose a risk to the public and pet dogs. Some producers post signs to alert the public that LGDs are in use in the area as a nonlethal method to reduce conflicts with native predators and may bark aggressively if livestock are approached too closely.

If you are going to use LGDs in a fenced or pasture operation (as is usually the case in the midwestern and eastern United States), introduce and restrict them to the location where they will be working at an early age to discourage roaming outside pastures.

If you are using LGDs and not getting good results, you may need to re-examine the number of dogs you are using per flock/herd or setting. Also review how to choose and raise pups—especially during the critical development period between two and 12 weeks of age—and, in general, what best matches your needs in a LGD.

For livestock guardian dogs to work successfully, a thorough understanding of LGD training and management and how this proactive approach applies to your operation is vital. ■

KEY POINTS: Livestock Guardian Dogs

- To determine if LGDs are an appropriate choice to help protect your livestock from conflicts with wolves, carefully evaluate your particular operation with the help of professionals experienced with the use of these dogs.
- Consider breed types that best suit your livestock operation and its proximity to the public. Select pups from working stock that demonstrate effective protectiveness on operations similar to your own.
- LGDs defend livestock from wolves by alerting people to the presence of wolves, not by fighting off the wolves. Once they sound a warning alert, LGDs need human support, such as a herder, to use other methods to scare predators away.
- From April through June, keep LGDs away from active wolf den sites to avoid attacks from wolves defending their young.
- If you are already using LGDs but not seeing results, contact a wolf-management specialist in your state to help you re-evaluate.

4. Erecting Barriers: Fencing, Fladry and Penning

Barriers are used effectively to deter predators such as wolves and bears throughout North America, Europe and Asia. Electric fences or combinations of wire mesh and electric fencing have been particularly successful, especially when used for protection at night when wolves are more likely to prey on livestock. Some types of fencing are portable and can be used with good results even in open-range situations. There are also ways to increase the effectiveness of fencing with the addition of fladry, a barrier consisting of a series of red or orange flags hung at regular intervals along a thin rope. Fladry can be used alone or strung along an existing fence line.

Fladry was first developed and used by hunters in Eastern Europe to funnel wolves into an area. Once caught in the fladry trap, wolves were reluctant to cross the barrier and were shot as they tried to escape through the narrow end of the funnel. In Canada and the United States, researchers adapted the fladry technique as a nonlethal method for keeping wolves out of livestock enclosures. There is also an electrified version of fladry called "turbofladry," which is fladry hung on an electrified line, which can be powered by solar-charged batteries. Wolves that attempt to cross the turbofladry or try to bite or touch the barrier—as wolves often do—experience a harmless but mildly painful electric shock similar to that of a dog shock collar. Turbofladry or electric wire mesh fencing may also be considered an aversive conditioning tool since the wolf has a negative experience—shock upon contact—which can potentially extend the length of time these barriers are effective.

Choosing and using barriers

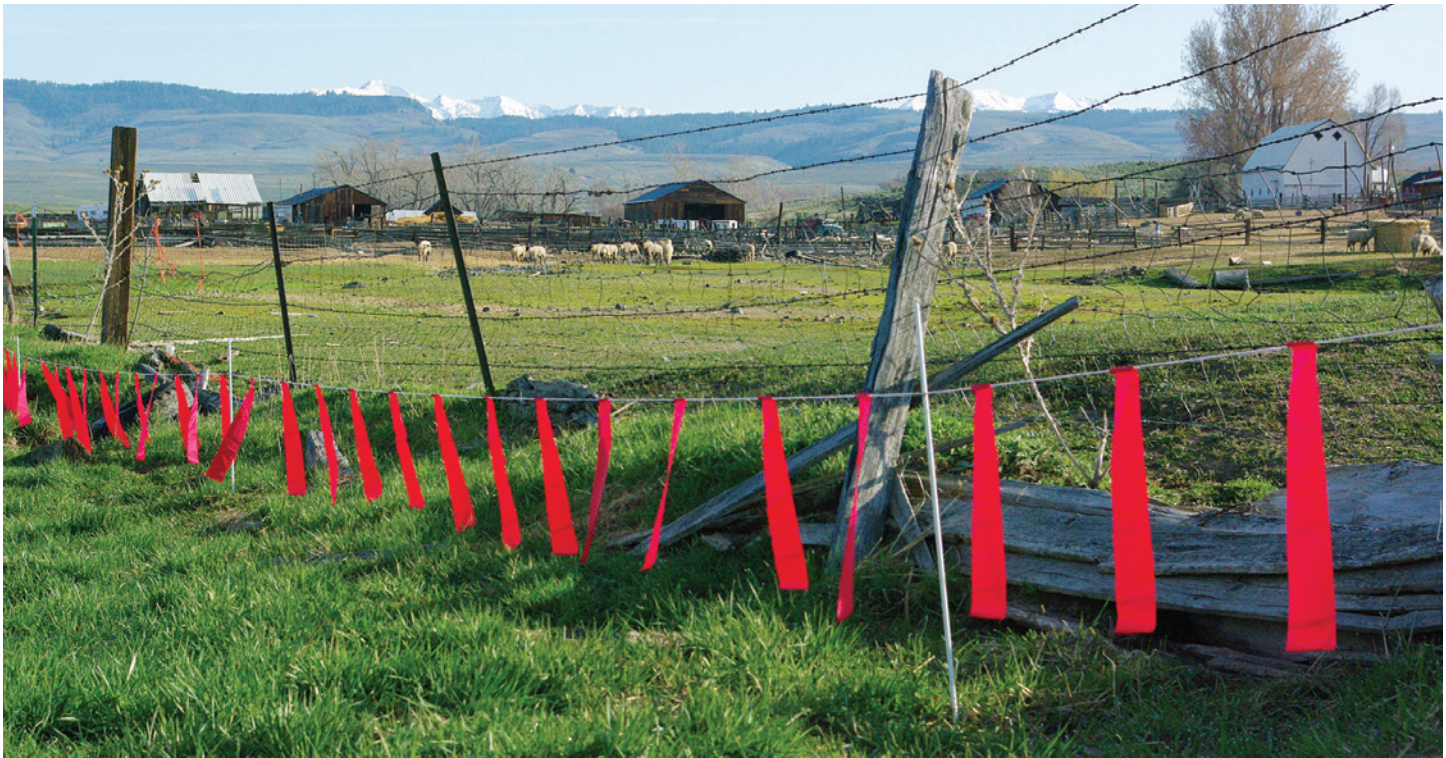
Permanent fencing

Permanent fencing has proved to be a very effective deterrent in certain conditions. It tends to be more suitable for smaller operations where livestock use night corrals or small pastures. The fence must be sturdy, tall enough so predators cannot climb or jump it, and free of any gaps where a predator could slip through. Since the height needed depends on the fencing material (woven versus electric, for example) and the type of livestock, seeking the guidance of biologists or wolf managers is highly recommended. These experts can help you assess your situation and design an effective permanent structure.

For livestock kept in large enclosures or on open range, permanent fences are typically too costly to build and maintain. In addition, permanent fences are not portable and of little use with freely roaming livestock. For example, using predator deterrent fencing such as electric woven wire, multistrand, high railing, or similar obstructions on open-range grazing allotments is usually not allowed on public lands, is very expensive and can injure deer and other wildlife. Some of these allotments are on national forests in the northern Rockies—also prime wolf and bear territory—and have some of the highest livestock losses to predators. Livestock in this area are often moved on a seasonal basis or grazed on open ranges during the spring, summer and fall.

Turbofladry, fladry hung along electrified fencing, adds the element of shock, boosting the effectiveness of the fladry barrier.

OREGON DEPARTMENT OF FISH AND WILDLIFE



Portable fencing

Portable fencing or pens can be a very effective alternative when permanent fencing is not a good option. Portable fences can be made from several different types of materials including multiple electric fencing strands, wire netting or mesh, and portable panels. The cost, utility and effectiveness vary based on the type and number of livestock and the terrain. To help reduce livestock stress, get your animals accustomed to the portable pens by using them during feeding times, etc. If you have a grazing allotment, make sure your grazing permit allows the use of portable fencing. You should also regularly move the fencing to keep native plants from being trampled or overgrazed.

Fladry and turbofladry

Fladry fences are much less expensive to produce and install than wire or permanent fencing. Fladry is also easily moved and can be quickly installed over large areas by one person. To be effective, it is important to install the fladry properly. Researchers used red or orange reinforced plastic flags measuring 50.8 centimeters by 10 centimeters (approximately 20 inches by four inches) sewn at 50.8-centimeter (20-inch) intervals on a 0.2-centimeter (0.8 inch) diameter nylon rope suspended so that flags hang 50.8 centimeters (20 inches) above the ground on secure posts spaced roughly 30 meters (98 feet) apart. Depending on the type of materials used, fladry may require regular maintenance to keep it from coiling around itself or the rope, dropping too low or hanging too high. Cattle are also known to chew and pull on fladry. A broken, frayed, tangled, pinned down or otherwise compromised fladry will not deter predators and must be replaced. Properly designed fladry and turbofladry can be difficult to find commercially. Contact your local wildlife or agriculture agency.

Fladry alone is most effective as a short-term (30- to 45-day) deterrent. As with all proactive methods, wolves may stop responding after repeated exposure, rendering the method ineffective for preventing losses. Studies have shown that the added "bite" of turbofladry—fladry on top of electrified line—although more expensive, can remain effective three or more times longer than regular fladry. ■

KEY POINTS: Barriers

- The type of predators and livestock present and the grazing conditions are important factors in considering what type of barrier to use.
- Permanent fencing can be a good option for smaller operations where night corrals or small pastures can be fenced affordably.
- Under open-range conditions, portable fencing and pens are easier to install and more affordable, but stress to livestock and native plants as well as grazing permit restrictions should be considered.
- Fladry can be used alone or as an addition to permanent or portable fencing. It is relatively inexpensive, but must be preordered, properly installed at the right height, and regularly maintained.
- Turbofladry is effective three or more times longer than regular fladry but requires electricity to charge. Supplies of both types are limited in the United States, so fladry orders may take considerable time to process.
- Consult a wolf manager experienced with the different types of barriers to help determine which one is best for your operation.

FLADRY SAVES THE NIGHT

© BRAD DEVRIES/DEFENDERS OF WILDLIFE

After repeated wolf attacks claimed dozens of sheep and led to expensive government lethal control of two wolf packs, one sheep producer was ready to try something new. With the help of agency experts, he installed a portable electric night pen on his operation near Red Lodge, Montana. As a second line of defense in case the solar battery failed, he added a strand of fladry to the outside perimeter of the pen. The sheep soon became so accustomed to the pen, they entered it on their own at day's end.

In the three years after installing the night pen, the producer reported losing only one animal to wolves–a ewe accidentally left outside the pen.

One spring night the power source for the pen's electric fencing failed. The next day, sheep managers found a set of wolf tracks in the snow. The tracks led up to the pen, turned away and reapproached it from another side before turning away again and wandering off. The fladry barrier effectively deterred the wolves from killing sheep while the electric fencing was not working.

5. Increasing Human Presence: Range Riders and Herders

Livestock losses from wolves often occur when the producer is unaware of wolves in the area. Being aware of wolf activity helps producers and wildlife managers develop strategies for best protecting livestock. Increasing human presence on the range with riders for cattle operations and more herders for sheep allows you to monitor your livestock and wolf activity and may be one of the best ways to deter wolves.

A range rider, for example, can patrol your ranch or allotment at dawn and dusk when wolves are most active. The rider checks for signs of unusual agitation in the cattle, behavior that can indicate wolves or other predators are in the area. The rider also listens for howling and looks for other signs that wolves are present such as tracks, scat and hair snagged in fences.

Rider protocols vary from place to place, but the underlying concept is similar: Regular or frequent human presence can minimize livestock loss to wolves that avoid contact with humans or by intervening when wolves attempt to prey on livestock. In the best scenarios, riders who are able to respond quickly to wolves approaching or chasing livestock can prevent losses from occurring simply by their presence.

Range rider and herder basics

Cattle on public grazing allotments—and in some circumstances on private lands—are often spread across a wide area, which may include open prairie, rugged terrain and partially or heavily forested land. Cattle may be gathered or scattered depending on the operation. As such, range riders may have to cover as much ground as possible while checking on livestock and may not be in exactly the right location at exactly the right time to respond to wolves. Even so, the chances of preventing a loss are still better than in places where human presence is less frequent. Those chances can be improved if cattle are in a managed herd rather than scattered across the landscape.

From 2005 to 2015, range-rider projects sponsored by Defenders and others reported low-to-zero losses in comparison to the higher losses recorded before the riders were deployed. With so many variables from place to place, there is no absolute proof that range riders actually prevented livestock losses, but when surveyed, most participating producers said they credited the range-rider program with preventing losses and were interested in continuing the practice.

Range riders increase the human presence on grazing lands, and the more people on the range, the less likely wolves are to come around.

Like cattle operations, sheep operations can benefit from adding more herders to increase protection for their animals. This is especially true at night when the sheep are on bedding grounds and most vulnerable to predators. The additional herder can cover the night shift and focus on preventing losses to predators. Herders can also boost their effectiveness by working with livestock guardian dogs that can alert them to the presence of wolves and other predators.

Riders and herders can monitor livestock closely, providing other advantages such as finding dead livestock and identifying cause of death and providing early detection of injury, illness or stress in the herd. Riders can also assist with preventing livestock from overgrazing sensitive meadows and streambeds, reducing the chances of livestock theft and detecting the presence of plants toxic to livestock. Adding this kind of personnel increases production costs for the livestock operation but may be worth the cost if losses to predators and other threats are minimized. Finding experienced riders and herders can be difficult because wages are often low and the work is hard, especially when it involves nighttime surveillance and camping with livestock. Agencies, conservation groups and other ranchers may be able to help by pooling resources for range riders, adding herders and providing other preventative measures. ■

KEY FACTORS: Increasing Human Presence on the Range

- Using range riders for cattle operations and more herders for sheep operations provides important protection against predators.
- Range riders can monitor livestock while looking for signs of wolves and other predators and scaring away any that approach livestock operations. Check with local authorities about hazing and aversive conditioning techniques that may be applicable to your area. Rules vary by state and species.
- Ideally, sheep herders can work in shifts allowing the herder on night duty to deter predators while sheep are on bedding grounds.
- Increased human presence has other benefits. For example range riders can quickly find diseased, injured or dead livestock and treat or determine the cause of death; remove carcasses that attract predators; protect sensitive grazing areas; prevent livestock theft; and provide early detection of diseases and of plants toxic to livestock.
- Agencies, conservation organizations and other ranchers can work together to pool resources to establish range-rider or herder programs.

REKINDLING HERD INSTINCTS: STOCKMANSHIP

Some range riders use stockmanship, the skillful handling of livestock in the "low-stress manner" pioneered and taught by renowned stockman Bud Williams. Low-stress livestock handling relies on pressure and release rather than force or fear and is fundamentally different from conventional handling. Practitioners use the low-stress approach to move, herd and even place cattle, often at higher stocking densities.

This type of management allows cattle to feel more comfortable staying in closer groups, which mimic natural herds, and may promote defensive behavior in cattle such as standing their ground against predators and defending their calves when threatened.

Livestock are most vulnerable to predation when scattered over large areas. The behavior encouraged by the low-stress methods of the Bud Williams Stockmanship School, the Savory Institute and other programs could make cattle less vulnerable to wolves by encouraging them to act as a herd. The approach is based on the strategy observed in bison of forming large herds and standing their ground to reduce the risk of predation by wolves.

Researchers are now investigating the use of low-stress livestock handling as a tool for reducing livestock-predator conflict. In recent experiments, cattle managed with the low-stress approach displayed a rekindled herd instinct, stayed together and suffered no depredation in an area known to be inhabited by predators.

Low-stress livestock handling is proving to be a viable option for improving rangeland health and grazing management and potentially reducing livestock losses to predators.

A range rider monitors a herd in Montana.

6. Using Scare Tools and Tactics: Alarms, Lighting and Nonlethal Ammunition

Researchers are constantly developing and testing tools and methods for keeping wolves away from livestock.

A wide range of devices can be used to protect livestock against wolf depredation. Some are highly technical, others have been around for centuries and can be surprisingly simple. Banging a wooden spoon on a metal pot, for example, has successfully frightened wolves away from a sheep band bedded down at night in a mountain meadow. Multiple devices and methods may also be required. Herders in the central Idaho's Wood River Wolf Project report that a combination of dogs, spotlights and human presence is the best strategy for protecting sheep in wolf country.

Scare devices

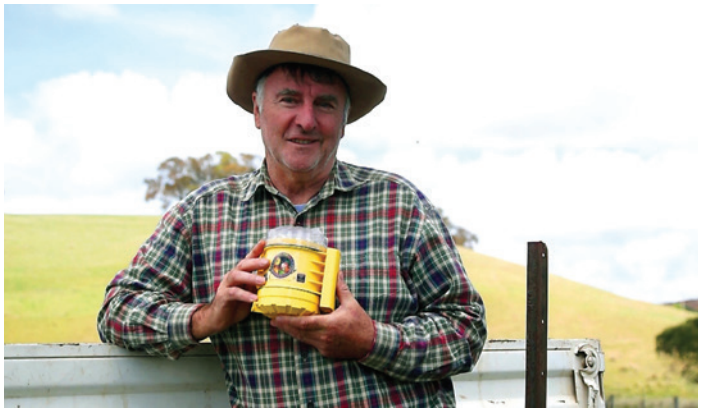
Field technicians and herders in the Wood River Wolf Project have been successfully deterring wolves with air horns, starter pistols and high beam flashlights when they encounter them near sheep at night. These inexpensive ($10 to $50) devices alert wolves at greater distances to the presence of humans and are used when wolves and other predators are detected near livestock.

Radio-activated alarms

In the early 1990s, a Montana rancher had an idea for an alarm system triggered by the radio collars that biologists use to track and monitor wolves. Based on this idea, researchers from U.S. Department of Agriculture Wildlife Services developed what is now known as a radio-activated guard system—"RAG box" for short.

RAG boxes consist of a receiver, a bright strobe light, two loudspeakers and an internal computer that collects and stores information received from transmitters on wolves' radio collars. To keep wolves from getting used to any one sound, RAG boxes produce a variety of alternating sounds, which can range from sirens to gunshots to beating helicopter blades to cowboys yelling on horseback. The RAG box can be attached to a fence line or placed nearby and set to go off whenever it picks up a preprogrammed radio-collar signal (it only works on radio-collared animals). Power is supplied to the RAG box either through a 12-volt car battery, which needs to be charged every couple of weeks, or through a solar panel that recharges itself. Studies by Wildlife Services and the University of Nebraska found that RAG boxes are most effective for small pastures (60 acres or less), especially when lambing or calving is taking place in smaller enclosures. Training is necessary to learn how to operate the receiver, and the RAG box system is also initially expensive due to the cost of assembly.

DEFENDERS OF WILDLIFE



Ian Whalan, the Australian sheep and cattle farmer who invented Foxlights in 2008 to address his country's serious problem of fox predation on newborn lambs, shows off his brainchild. In 2013, Defenders' nonlethal wolf control expert visited an Australian project that was using the lights to deter dingoes and brought a shipment of the devices back to the United States. Since then, Foxlights have been successfully used to keep wolves away from livestock in Idaho, Montana, Oregon, Washington and Wyoming.

Automated light devices

The variety of automated lighting devices aimed at guarding against predators ranges from motion-sensitive lights to infrared light emitters. As with any device or method, exposing predators to lighting devices too frequently can cause habituation and diminish or eliminate the desired response.

A new device called the "Foxlight" avoids easily detectable patterns so that night predators do not quickly become accustomed to it. The Foxlight uses an intermittent series of lights in varying, random flash patterns to simulate human activity, such as someone moving a torch around, which stops human-wary predators from approaching.

Foxlights are still being tested in the field, but their effectiveness for reducing livestock losses appears to be short-term (30 days or less). Like other deterrents, Foxlights and similar devices may work best as a temporary deterrent or in tandem with other deterrents. Evidence also suggests that they may be more effectively used proactively to prevent predation rather than reactively to deter an ongoing problem.

Nonlethal ammunition

Certain types of ammunition that make a loud sound when fired or that can hit an animal without injuring it can be used to scare away wolves. These alternatives to conventional ammunition include beanbag shells, paintballs and rubber bullets.

Beanbag shells are square bags filled with beans and rolled up. Paintballs are gelatin capsules filed with nontoxic, water-soluble dye and shot from a special compressed-gas-powered marker or gun. At normal velocities (up to 300 feet per second), paintballs break on impact. They can strike a wolf with enough force to frighten it and possibly bruise it. Rubber bullets are bullets made of, or coated with, rubber. Fired at short range, rubber bullets can be lethal and are often heavy enough to pierce skin even at proper ranges.

Because nonlethal ammunition can inflict serious injuries if used improperly, it is important to learn how to use it and to understand the specific conditions under which the various types can be safely and legally used. In some areas these tools are prohibited or require a permit. See the Resource Directory to find an agency expert in your state for more information, training and permits. ■

KEY POINTS: Scare Tools and Tactics

- Alarm systems and nonlethal ammunition can be effective tools for scaring wolves away from livestock and alerting livestock managers to the presence of wolves.
- Foxlights are among the new predator-deterrent light devices now on the market. These deterrents turn on at dusk and emit lights until dawn. Foxlights also have a strobe type of lighting that looks like a flashlight moving in the dark.
- Nonlethal ammunition either makes an explosive sound to scare wolves away (such as an air horn) or strikes the animal with just enough force to frighten it (beanbag shells, rubber bullets and paintballs).
- The use of alarm systems or nonlethal ammunition may require training and a permit. Nonlethal ammunition can inflict serious injuries or death if it is used improperly.

WOOD RIVER WOLF PROJECT

In 2007, a wolf pack killed sheep and livestock guardian dogs on national forest land in the Sawtooth National Recreation Area in Blaine County, Idaho, near the historic Sawtooth Sheep Driveway, a "super-highway" for moving thousands of grazing sheep along the Big Wood River. But instead of the usual response of calling in government wildlife control agents to kill the wolf pack, which had gained popularity among wildlife watchers in the area, county residents and officials decided to try another approach. Thus the Wood River Valley Wolf Project was born.

The project is a comprehensive effort to use alternative nonlethal livestock-protection methods rather than lethal control. The methods used include increased human supervision near livestock, nighttime sheep band and wolf monitoring, hazing of wolves that linger near livestock, removing attractants such as carcasses, and avoiding grazing areas near den and pup rendezvous sites.

In the first seven years of the project, wolves killed fewer than five sheep per year out of the 10,000 to 22,000 grazing in the project area–the lowest loss anywhere in Idaho's wolf and sheep-grazing range.

The Wood River Wolf Project continues to work with local stakeholders, using a community model to address conflicts with nonlethal, adaptive strategies and to implement solutions collaboratively. To learn more about the project, contact the Lava Lake Institute for Science and Conservation (see "Tools and Strategies," page 21).

DEFENDERS OF WILDLIFE

7. Switching Grazing Strategies

Proactive measures cannot always be implemented quickly or effectively enough to prevent livestock losses. In such cases moving livestock to an alternate grazing site can be a viable solution for livestock owners and wildlife managers alike.

These relocations can be temporary (especially on private land) or—if the grazing permittee is willing—involve permanent exchange of grazing allotments. Some wildlife conservation groups or land trusts have purchased grazing permits from livestock owners on a voluntary basis to end chronic conflict and lethal wolf and grizzly control. This approach has enabled ranchers to continue raising livestock in areas with less conflict potential.

Important factors to consider

Cooperative agreements to temporarily switch or permanently retire grazing allotments can help reduce livestock-predator conflicts and provide benefits to other wildlife species such as elk and deer. There are many examples of ranchers, conservationists and agency officials successfully working together to adjust the timing and location of allotments to minimize conflicts with wildlife and allow livestock grazing activities to continue. In some cases of permanent grazing allotment retirement, willing ranchers have received payment for the value of their public grazing permits in high-conflict areas and then used the funds to lease or purchase new pastures in other areas where losses from predators were less likely.

Livestock relocations may not have to be permanent. Predator-caused livestock losses most often occur when livestock are most vulnerable—during calving or lambing, for example, during the spring when grazing near a wolf den site with pups that need to be fed. In such instances, a temporary move such as shifting calving and lambing activities closer to the barnyard to allow for additional monitoring may be an alternative. Wolf-livestock experts in your region (see Resource Directory) can assist with evaluating your specific situation and work with you to come up with the most appropriate conflict mitigation technique for your operation. ■

KEY POINTS: Switching Grazing Strategies

- Moving livestock, even temporarily, to an alternative grazing location to avoid conflicts with wolves can be a win-win solution.
- Switching to alternative grazing sites can be challenging because of the logistics of the move, the expense and the viewpoints of all involved. However, it can also be an opportunity to bring people together to jointly find a solution that helps the producer, the livestock and the wolves.

Sheep move through a grazing allotment in Idaho's Sawtooth National Forest.

8. Other Methods Worth Considering

You may have heard of other methods used by operators to prevent wolf-livestock conflicts. Most accounts of these efforts are anecdotal and involve approaches not yet scientifically analyzed or compared. Conditions vary for each operation, which can impact the effectiveness of these approaches. Other methods may come to light as operators, government agencies and others work to reduce conflicts between livestock and predators. Defenders of Wildlife is collecting data on these methods and helping to evaluate them as they are developed in the field. A few examples of promising approaches used by some livestock operations are highlighted below.

"Mountain-savvy" versus "naïve" cows

Ranch managers in southwestern Alberta have noticed that cows familiar with wolves are less vulnerable to depredations than cows outside of wolf territories. Similarly, ranchers who regularly transported naïve, pregnant cows from prairie pastures to the rugged mountains of Gila National Forest in New Mexico reported high rates of livestock losses.

In these instances, the cow's unfamiliarity with wolves or the new landscape and lack of maternal experience likely contributed to high calf mortality as opportunistic wolves moved in quickly to take advantage of the situation. More and more, ranchers in the western United States are reporting witnessing mother cattle successfully defending their calves from wolves.

Bells on cattle

One livestock producer in northeastern Oregon reports that placing bells on all his cattle has helped reduce losses to wolves in very remote and rugged terrain. Belling cattle is an old tradition but may become more popular if this strategy does reduce losses to predators. The bell produces a loud racket if the cow wearing it starts to run. This may help counter the predator's instinct to give chase.

KEY POINTS: Other Methods Worth Considering

- Cattle experienced in defending their calves from wolves lose fewer calves than naïve cattle that don't defend their young from depredation.
- Herding and stewardship methods that cause cattle to herd up may make them less vulnerable to wolf attacks. See the Resources Directory for contact information for stewardship and herding advocacy organizations.
- Planning and managing calving for condensed seasons, sharing labor and resources with neighbors or scheduling calving for a time when wolf pups have other young wild prey are some strategies that may help reduce predator conflicts.

© LNZPHOTOGRAPHY/ADOBE

Calving strategies

In areas where year-round livestock grazing is possible, calving can occur throughout the year, often in locations that are difficult to monitor. In predator-occupied areas it may be helpful to schedule and manage for a condensed calving season to better monitor calving activities. Not only can this reduce predator conflicts when livestock are most vulnerable, but, according to some ranchers, can also help address other problems such as calving complications and accounting of herd numbers. In addition, predator-resistant electric fencing or barrier fencing of calving pastures can help deter a wide array of predator species.

In other regions of the world, ranching neighbors often plan and set up "calving camps" to help one another by sharing labor and resources during this critical time. In addition to deterring predator losses, calving camps can help 1) increase calf delivery success by assisting cows and heifers having problems; 2) detect and treat sickness; 3) oversee 36-hour weaning period for rebreeding of females; 4) supplement the feeding of calves during drought; and 5) help tame calves. Another benefit of planned calving is that it allows ranchers to conduct calving activities in easily monitored locations and during the daylight with minimal predator conflicts. Some ranchers report increasing their success during calving season by keeping bulls as part of the calving herd and allowing other aggressive animals, such as donkeys, to mingle with the herd. ■

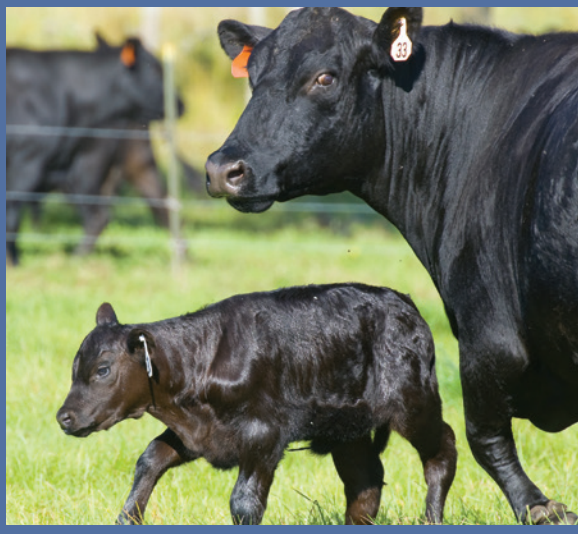
COW-CALF PAIRS VS. YEARLINGS

Ranchers in the United States and Canada have noted differences in the relative vulnerability of yearlings and cow-calf pairs to wolf attacks. Based on the livestock compensation data collected over the last 25 years in the northern U.S. Rockies, for example, wolves have killed calves far more frequently than any other age group of cattle. In Canada, however, yearlings appear to be more prone to wolf attacks than calves raised with mother cattle.

Many ranchers graze yearlings because these younger animals will actively seek grass in less accessible portions of the range. As they range more widely across pastures, yearlings become vulnerable to wolves. They also tend to investigate novel sights and sounds, even to their own peril.

In Alberta, cow-calf pairs tend to bunch up in response to an approaching predator, and mother cows have been known to stand and protect their calves. In the northern U.S. Rockies, however, converting from yearlings to cow-calf pairs has resulted in increased losses. Some of the ranchers who converted experienced wolf attacks on their livestock for the first time.

More monitoring and research are needed to better understand the reasons for these regional differences. Factors such as the type of landscape, size of allotment pasture, breed, maternal instinct and experience with predators may all play a role in determining whether yearlings or cow-calf pairs fare better against wolves in any given situation.



© STEVE OEHLENSCHLAGER/ADOBE

Cow-calf pairs may fare better against predators in some regions. In others, grazing yearlings keeps losses down.

Resource Directory

State, tribal and federal agencies and other sources of information and assistance in the United States and Mexico

NOTE: **Financial assistance** for the use of nonlethal tools is sometimes available through state and federal programs. The availability of funds can change from year to year and state to state. Check with your state agriculture and wildlife agencies to learn more. **Compensation** for livestock lost to certain predators may be available through the U.S.D.A. Farm Service Agency's Livestock Indemnity Program. See your local Farm Services Agency for more information.

ARIZONA

Mexican Wolf Interagency Field Team: 928.339.4329

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement, Southwest Region: 505.248.7889

For information about financial assistance and proactive tools:
Mexican Wolf/Livestock Coexistence Council: 505.761.4748
Farm Service Agency/Arizona State Office: 602.285.6300
Defenders of Wildlife (Tucson office): 520.623.9653

CALIFORNIA

To report a dead wolf or possible illegal activities involving wolves:
California Department of Fish and Wildlife: 530.225.2300, 888.334.2258 or californiawolfsightings@wildlife.ca.gov
U.S. Fish and Wildlife Service: 916.414.6660

To report livestock depredation:
California Department of Fish and Wildlife, Redding Office: 530.225.2300
U.S.D.A. Wildlife Services: 530.336.5623
U.S. Fish and Wildlife Service: 541.885.2525

To report wolf sightings or wolf sign:
California Department of Fish and Wildlife: 530.225.2300, californiawolfsightings@wildlife.ca.gov or https://www.wildlife.ca.gov/Conservation/Mammals/Gray-Wolf/Sighting-Report

For information about proactive tools:
Defenders of Wildlife, Sacramento Office: 916.442.5746

COLORADO

Colorado Division of Wildlife: 303.297.1192
U.S. Fish and Wildlife Service: 303.236.7905

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement: 720.981.2777
Colorado Parks and Wildlife: 877.265.6648

For information about proactive tools:
Defenders of Wildlife (Denver office): 303.925.0918 ext. 450

IDAHO

Idaho Fish and Game (Ask for the wolf management specialist)
Boise: 208.334.2920
Salmon: 208.756.2271
Nampa: 208.465.8465
Nez Perce Tribal Wolf Program: 208.634.1061

To report a dead wolf or possible illegal activities involving wolves:
Idaho Tip line, Idaho Fish and Game Law Enforcement: 800.632.5999

To report livestock depredations or for assistance with proactive tools: U.S.D.A. Wildlife Services: 208.378.5077 or 208.373.1630

To file for livestock compensation from the state:
Idaho Supplemental Wolf Compensation Program: 208.334.2189 or email Jon.beals@osc.idaho.gov

For information about financial assistance with proactive tools:
Office of Species Conservation: 208.334.2189

For information about proactive tools:
Defenders of Wildlife (Boise office): 208.424.9385

MICHIGAN

For information on reducing predator-livestock conflicts, the state wolf compensation program and wolf management in general:
Michigan Department of Natural Resources Wolf Coordinator: 906.228.6561

To report livestock losses, a dead wolf on your property or possible illegal activities involving wolves:
Michigan Department of Natural Resources: 800.292.7800

For information about financial assistance for proactive tools and depredation compensation:
Michigan Department of Agriculture: 888.684.1158 (Escanaba); 800.292.3939 (Lansing)

For information about proactive tools:
Defenders of Wildlife (national office): 202.682.9400
Michigan Department of Natural Resources Wolf Coordinator: 906.228.6561

For information about husbandry practices to prevent conflicts:
Michigan State University Extension: 906.228.4830 (regional office); 906.439.5880 (Upper Peninsula office)
Michigan Department of Agriculture: 888.684.1158 (Escanaba); 800.292.3939 (Lansing)

MINNESOTA

Minnesota Department of Natural Resources: 651.295.5175

To report suspected livestock depredation, a dead wolf on your property or possible illegal activities involving wolves:
Minnesota Department of Natural Resources Information Center (Find Local Conservation Officer): 651.296.6157 (in-state); 888.646.6367 (out of state), your county sheriff's office or U.S.D.A. Wildlife Services: 218.327.3350

For information on state compensation for verified livestock depredation: Minnesota Department of Agriculture: 651.201.6578

For information about proactive tools:
Defenders of Wildlife (national office): 202.682.9400
Minnesota Department of Agriculture: 651.201.6578

MONTANA

Montana Fish, Wildlife and Parks (Ask for the wolf management specialist)

Helena: Headquarters, 406.994.4042 or
Helena Area Resource Office, 406.495.3260
Billings: 406.247.2940
Bozeman: 406.994.6371
Butte: 406.494.1953
Great Falls: 406.454.5840
Kalispell: 406.752.5501
Missoula: 406.542.5500

To report a dead wolf or possible illegal activities involving wolves:
Montana Fish, Wildlife and Parks: Tip-Mont is a toll-free hotline to report poaching and other crimes. It stands for "Turn in Poachers Montana." Call 800.847.6668 (800 TIP MONT). Callers can remain anonymous and may be eligible for cash rewards.

To report livestock depredations:
U.S.D.A. Wildlife Services: 406.657.6464

For information about financial assistance for livestock loss prevention and depredation compensation:
Montana Livestock Loss Board: 406.444.5609

For information about proactive tools:
Defenders of Wildlife (Missoula office): 406.728.8800

NEW MEXICO

Mexican Wolf Interagency Field Team: 928.339.4329

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement, Southwest Region: 505.248.7889

For information about financial assistance for proactive tools and depredation compensation:
Mexican Wolf/Livestock Coexistence Council: 505.761.4748
Farm Service Agency, New Mexico State Office: 505.761.4900
Defenders of Wildlife (Tucson office): 520.623.9653

OREGON

Oregon Department of Fish and Wildlife: 503.947.6000 or 800.720.6339

To report a dead wolf or possible illegal activities involving wolves:
Oregon Department of Fish and Wildlife: 503.947.6000 or 800.720.6339
U.S. Fish and Wildlife Service, Office of Law Enforcement: 503.682.6131

To report wolf sightings or wolf sign:
Oregon Department of Fish and Wildlife: 541.963.2138
U.S. Fish and Wildlife Service: 541.786.3282 or 888.584.9038

For information about financial assistance for proactive tools and depredation compensation:
Oregon Department of Agriculture: 503.986.4767

For information about proactive tools:
Defenders of Wildlife (Boise office): 208.424.9385

UTAH

Utah Division of Wildlife Resources: 801.538.4700
U.S. Fish and Wildlife Service: 801.975.3330

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement: 720.981.2777
Utah Division of Wildlife Resources: 801.538.4700

For information about proactive tools:
Defenders of Wildlife (Boise office): 208.424.9385

WASHINGTON

Washington Department of Fish and Wildlife: 360.902.2200

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement: 425.883.8122
Washington Department of Fish and Wildlife: 877.933.9847

To report livestock depredation:
Washington Department of Fish and Wildlife: 877.933.9847

For information about financial assistance for proactive tools and depredation compensation:
Washington Department of Fish and Wildlife (Compensation): 360.902.2490
Washington Department of Fish and Wildlife (Prevention): 360.902.2476

To report wolf sightings or wolf sign:
U.S. Fish and Wildlife Service
Eastern Washington: 509.891.6839
Western Washington: 360.753.9440
Wolf Reporting Hotline: 888.584.9038

For information about proactive tools:
Defenders of Wildlife, Boise Office: 208.861.4655

WISCONSIN

Wisconsin Department of Natural Resources: 715.762.1363

To report a dead wolf that appears to have been killed illegally or to have died from an unknown cause:
Wisconsin conservation warden, local sheriff or Wisconsin Department of Natural Resources tip line: 800.847.9367
If no illegal activity appears to be involved, contact a Department of Natural Resources biologist.

To report livestock depredations or for assistance with proactive tools:
U.S.D.A. Wildlife Services:
Northern Wisconsin: 800.228.1368 (715.369.5221 out of state)
Southern and Central Wisconsin:
800.433.0663 (920.324.4514 out of state)

For information about financial assistance for proactive tools and depredation compensation:
Wisconsin Department of Natural Resources Bureau of Wildlife Management: 715.356.5211, ext. 234

For information about proactive tools:
Defenders of Wildlife (national office): 202.682.9400
Wisconsin Department of Natural Resources: 715.365.8917

WYOMING

U.S. Fish and Wildlife Service: 307.330.5631
Wyoming Game and Fish: 307.777.4600

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement: 307.261.6365

To report livestock depredations or for assistance with proactive tools:
U.S.D.A. Wildlife Services: 307.261.5336 or 866.487.3297

For information about financial assistance for proactive tools and depredation compensation:
Wyoming Game and Fish: 307.777.4600
Wyoming Animal Damage Management Board: 307.777.6781

For information about proactive tools:
Defenders of Wildlife (Boise office): 208.424.9385

MEXICO

Mexican Wolf/Livestock Coexistence Council 505.761.4748
Defenders of Wildlife
- Tucson office: 520.623.9653
- Mexico office: 52.55.55.96.21.08

To report a dead wolf or possible illegal activities involving wolves:
U.S. Fish and Wildlife Service, Office of Law Enforcement (New Mexico): 505.346.7828
Defenders of Wildlife: 520.623.9653

ADDITIONAL RESOURCES

Tools and techniques

Defenders of Wildlife:
www.coexistingwithcarnivores.org

Management strategies

Bud Williams Schools, Springfield, Missouri
The schools are no longer offered, but DVDs on stockmanship and marketing are available.
www.stockmanship.com

Hand 'n Hand Livestock Solutions, Bolivar, Missouri
www.handnhandlivestocksolutions.com
The stockmanship and marketing schools pioneered by the late Bud Williams are now being taught by his daughter and son-in-law.

Lava Lake Institute for Science and Conservation, Hailey, Idaho
www.lavalakeinstitute.org
P.O. Box 2249
Hailey, ID 83333
208.788.1710

Savory Institute, Boulder, Colorado
savory.global/institute

Foxlights

Foxlights International Propriety Limited
www.foxlights.com
7/22-24 Sarsfield Circuit
Bexley North, NSW 2207
02.9150.9509
ian@foxlights.com

GENERAL INFORMATION

U.S. Fish and Wildlife Service
Endangered Species Program: endangered.fws.gov
Wolf Recovery Program: westerngraywolf.fws.gov
Western Great Lakes Wolf Recovery Program: www.fws.gov/midwest/wolf
Mexican Gray Wolf Recovery Program: www.fws.gov/southwest/es/mexicanwolf

U.S.D.A. Wildlife Services: www.aphis.usda.gov/ws

National Wildlife Research Center:
www.aphis.usda.gov/ws/nwrc

Nez Perce Tribe Wildlife Program:
www.nezperce.org/Programs/wildlife_program.htm

State wildlife agencies: www.fws.gov/offices/statelinks.html

Yellowstone National Park wolf restoration and pack data:
www.nps.gov/yell/learn/nature/wolves.htm

Bibliography

Barnes, Matt. 2015. *Livestock Management for Coexistence with Large Carnivores, Healthy Land and Productive Ranches.* Keystone Conservation. Bozeman Montana.

Bangs, E.E., J.A. Fontaine, M.D. Jimenez, T.J. Meier, E.H. Bradley, C.C. Niemeyer, D.W. Smith, C.M. Mack, V. Asher, J.K. Oakleaf. 2005. Managing wolf/human conflict in the northwestern United States. In *People and Wildlife: coexistence or conflict?* eds. R. Woodroffe, S. Thirgood, and A. Rabinowitz, 340-356. Cambridge University Press, Cambridge, United Kingdom.

Bangs, E., M. Jimenez, C. Niemeyer, T. Meier, V. Asher, J. Fontaine, M. Collinge, L. Handegard, R. Krischke, D. Smith, and C. Mack. 2005. Livestock guarding dogs and wolves in the northern Rocky Mountains of the United States. *Carnivore Damage Prevention News* 8: 32-39.

Beyer, D., T. Hogrefe, R. B. Peyton, P. Bull, J. P. Burroughs, and P. Lederle (editors). 2006. Review of social and biological science relevant to wolf management in Michigan. Michigan Department of Natural Resources, Lansing, Michigan, USA. http://www.michigan.gov/documents/dnr/Wolf_White_Paper_178870_7.pdf Accessed 10/2/2015 (This paper includes information about nonlethal options to help minimize livestock losses to wolves.)

Bradley, E. H., and D. H. Pletscher. 2005. Assessing factors related to wolf depredation of cattle fenced pastures in Montana and Idaho. *Wildlife Society Bulletin* 33:1256–1265.

Breck, S.W. and T. Meier. 2004. Managing wolf depredation in United States: past, present and future. *Sheep and Goat Research Journal* 9:41–46.

Breck, S.W., R. Williamson, C. Niemeyer, and J.A. Shivik. 2002. Non-lethal radio activated guard for deterring wolf depredation in Idaho: summary and call for research. In *Proceedings of the Vertebrate Pest Conference*, 20: 223–226.

Bussard, J. 2015. In Control of the Cows. *Working Ranch Magazine*. Abundant Life Media. Newport Beach. CA.

Chavez, A. and E. Giese. 2006. Landscape use and movements of wolves in relation to livestock in a wildland-agriculture matrix. *Journal of Wildlife Management* 70:1079-1086.

Coppinger, R. 2006. Using livestock guarding dogs as protection against wolf predation. In *Proceedings of the 2006 North American Wolf Conference Northern Rockies Nonlethal Wolf Management Workshop.* Chico Hot Springs, Montana.

Defenders of Wildlife. 2015. Living (and Making a Living) Alongside Wolves. Defenders Blog. http://www.defendersblog.org/2015/04/living-and-making-a-living-alongside-wolves/ Accessed 10/2/2015

Gehring, T. M., J. E. Hawley, S. J. Davidson, S. T. Rossler, A. C. Cellar, R. N. Schultz, A. P. Wydeven, and K. C. VerCauteren. 2006. Are viable non-lethal management tools available for reducing wolf-human conflict?: preliminary results from field experiments. In *Proceedings of the 22nd Vertebrate Pest Conference*, R.M. Timm and J.M. O'Brien, eds, 2-6. University of California, Davis, California. (This study evaluates the effectiveness of shock collars, livestock guarding dogs and fladry in reducing wolf use in areas of Wisconsin and Michigan.)

Gese, E. M., S.P. Keenan, and A.M. Kitchen. 2004. Lines of defense: coping with predators in the Rocky Mountain Region. Utah Agricultural Experiment Station. Utah State University. Logan, Utah. (The booklet examines the methods used by livestock owners and wildlife managers to identify and reduce losses to native predators including animal husbandry practices, guard animals, fencing and barriers and other devices.)

Holder, J. and W. Holder. Predator Avoidance Techniques; Herding, Power in Numbers. A Field Guide to Low Stress Herding.

Marker, L., D. Kraus, D. Barnett, and S. Hurlbut. 1991 Management Practices to Reduce Predator Conflict. In *Cheetah Survival on Namibian Farmlands*, 25–39. Solitaire Press. Windhoek, Namibia. Original publication sponsored by USAID-funded Environmental Education Project. http://cheetah.org/site/wp-content/uploads/2003/01/survivalbook.pdf Accessed 10/2/2015

Michigan Farm Bureau, Michigan Department of Agriculture, Michigan Cattleman's Association, Michigan State University Extension, Michigan State University Department of Fish and Wildlife, Michigan Department of Natural Resources, U.S.D.A. Wildlife Services. 2006. How to Minimize Livestock Losses to Predators: A Guide for Livestock Producers. Michigan Department of Natural Resources. Lansing, Michigan. http://cdm16110.contentdm.oclc.org/cdm/ref/collection/p9006coll4/id/37817 Accessed 10/2/2015

Minnesota Department of Agriculture. A Guide for Minnesota Farmers and Ranchers Living in Wolf Territory. Minnesota Department of Agriculture, St. Paul, Minnesota. http://www.mda.state.mn.us/grants/disaster/wolf.aspx Accessed 10/2/2015

Musiani, M. and P. Paquet. 2004. The practices of wolf persecution, protection, and restoration in Canada and the United States. *BioScience* 54: 50–60.

Smith, D.W., D. Mech, M. Meagher, W.E. Clark, R. Jaffe, M.K. Phillips, and J.A. Mack. 2000. Wolf—Bison Interactions in Yellowstone National Park. *Journal of Mammalogy.* 81:1128–1135.

Stone, S. A. 2009. Compensation and non-lethal deterrent programs: building tolerance for wolf restoration in the Rockies. Pp 141–158 in A new era for wolves and people: wolf recovery, human attitudes, and policy (M. Musiani, L. Boitani, P.C. Paquet eds.). University of Calgary Press. Calgary, Alberta.

Stone, S.A., S. Breck, J. Timberlake, P. Haswell, F. Najera, L. Schoen, B. Bean, C. Niemeyer, C. Weaver, and D. Thornhill. In Press. Adaptive use of nonlethal strategies for reducing wolf-sheep conflict in Idaho. *Pending Publication. Journal of Mammalogy.*

NOTES

DEFENDERS OF WILDLIFE
1130 17th Street, NW
Washington, D.C. 20036-4604
202.682.9400
www.defenders.org